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Aberdeen Proving Ground

MARYLAND

PRODUCTION PROOF-FIRING TEST OF LAUNCHER, ROCKET, 3.5 INCH,

M20A1R1, AND DEVELOPMENT TESTS OF LAUNCHER, ROCKET,

3.5 INCH, M20 EQUIPPED WITH LAUNCH MECHANISM, T-1

L. F. Project No. 517-05-012

DEVELOPMENT AND PROOF SERVICES

22nd Report

OCO Project No. T34-4019

ARMY--OS--ABERDEEN PROVING GROUND, MD--415

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PRODUCTION ENGINEERING TEST OF LAUNCHER, ROCKET,

3.5 INCH, M20A1B1, AND DEVELOPMENT TESTS OF

LAUNCHER, ROCKET, 3.5 INCH, M20

EQUIPPED WITH LATCH MECHANISM, T-1

TWENTY-SECOND REPORT ON ORDNANCE PROJECT TS-4019

DEVELOPMENT AND PROOF SERVICES
ABERDEEN PROVING GROUND, MARYLAND

Authority: ORDTS
Priority: 1A

BHMC:Gothlin/lr
17 February 1954

PRODUCTION ENGINEERING TEST OF LAUNCHER, ROCKET,

3.5 INCH, M20A1E1, AND DEVELOPMENT TESTS OF

LAUNCHER, ROCKET, 3.5 INCH, M20

EQUIPPED WITH LATCH MECHANISM, T-1

TWENTY-SECOND REPORT ON ORDNANCE PROJECT TS4-4019

DATES OF TEST: June - July 1953

OBJECT

To determine the suitability for field use, functional reliability, and performance of 3.5 Inch Rocket Launcher, M20A1E1 and the performance of the 3.5 Inch Rocket Launcher, M20, with Latch Mechanism, T-1.

SUMMARY

Four 3.5 Inch Rocket Launchers, M20A1E1, Serial Nos. 207931, 207932, 207935, and 207981 were received at this Proving Ground for Production Engineering testing. The launchers were subjected to a cycling test with inerted ammunition and were fired in connection with general functioning, environmental and aimed rapid fire and accuracy tests.

The 3.5 Inch Rocket Launcher, M20 with Latch Mechanism, T1, was used in the firing of the the development tests of the 3.5 Inch Rockets, T205E1 and T206E1.

CONCLUSIONS

It is concluded that the general design and functioning of the Production Launchers, and the M20 Launcher with the T1 Latch Mechanism, with minor exceptions, are satisfactory.

RECOMMENDATIONS

It is recommended that the minor deficiencies of the four Production 3.5 Inch Rocket Launchers, M20A1E1, and the 3.5 Inch Rocket Launcher, M20, with Latch Mechanism, T1, tested and noted in this report, be corrected and that the corrections be applied to all production launchers.

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I. INTRODUCTION

A. DISCUSSION

1. The 3.5 Inch Rocket Launcher, M20A1B1, was designed and fabricated to provide the Army Field Forces with a shoulder type launcher which would:

- a. Have a higher rate of fire than the standard type rocket launcher.
- b. Be safer to operate than the standard type rocket launcher.
- c. Eliminate the necessity for the long contact lead (blue) wires of the 3.5 Inch Rockets.

2. The exigency for such a weapon was recognized because:

a. The rate of fire of the standard M20 and M20B1 Launchers was low and it was necessary for the loader to :

- (1) Pull the long contact lead (blue) wire from the rocket expansion cone and remove the insulation from the free end of the wire.
- (2) Insert the rocket into the launcher tube and ascertain if the rocket was properly indexed in the launcher as the contactor latch blade of the launcher had to engage the unpainted groove in the shroud ring of the radial fins of the rocket.
- (3) Connect the long contact lead (blue) wire to a contact spring on the launcher.

b. Also, a safety hazard existed in loading the standard M20 and M20B1 Launchers if an incorrect loading sequence were used, i.e if the loader connected the blue lead wire to the contact spring before the loader had completely positioned the rocket in the launcher tube. If the gunner then pulled the trigger of the firing mechanism while the loader was still attempting to position the rocket, the rocket could be ignited. If this occurred, the loader would most probably be burned by the back blast of the rocket. Also, the rocket fin assembly could possibly become wedged into the launcher tube by the contactor latch resulting in a runaway launcher.

c. A danger existed that the long contact lead (blue) wire, at the instant of the rocket firing, could be whipped about the contact spring with a force great enough to cut or penetrate clothing causing injury or discomfort to either the loader or the gunner. In addition, with the knowledge that this could occur the gunner may flinch at the time of firing thereby decreasing the accuracy of the weapon.

3. A Latch Contactor Mechanism was suggested by Aberdeen Proving Ground Personnel and was further developed by the Harvey Machine Company. This mechanism, later designated as the Latch Contactor Mechanism, T1, performed the following functions:

a. Provided a loader's safety. When the arming lever was in the lead position, the firing circuit was broken and the rocket could not be fired until the arming lever was pushed into the fire position.

b. Indexed the rocket in the launcher tube when it was loaded. This was accomplished by means of stops which protruded into the launcher tube and stopped the forward motion of the rocket in the proper position for firing.

c. Provided a hot contact finger which rested on a hot contact band on the rocket fin shroud assembly. All standard 3.5 Inch Rockets are equipped with a hot contact band. This in conjunction with the holding detent completed the firing circuit to the rocket to be fired. Therefore, there is no need for the long contact lead (blue) wire in rockets fired by a launcher equipped with this Latch Contactor Mechanism.

4. A 3.5 Inch Rocket Launcher, M20, equipped with a development Latch Contactor Mechanism, T1, was development tested at this Proving Ground. The launcher and Latch Contactor Mechanism, were, in general, found to be satisfactory. The results of these tests were reported in the Sixteenth Report on Project TS4-4019.

5. A 3.5 Inch Rocket Launcher, M20, No. 153679, equipped with a further improved model of the development type Latch Contactor Mechanism, T1, was received for testing at this Proving Ground. This Launcher and Latch Contactor Mechanism were similar to the ones which were sent to Army Field Forces for evaluation. The Launcher and Latch Contactor Mechanism were tested and the results of the tests were recorded in this report.

6. Also four each 3.5 Inch Rocket Launcher, M20A1E1, Nos. 207931, 207932, 207935 and 207981 were taken from production at Birtman Electric Company and forwarded to this Proving Ground for Production Engineering Testing.

7. The results of the tests of these production launchers and the launcher with the Latch Contactor Mechanism, T1, form the basis of this report.

B. REFERENCES

1. Authority for Test - copy inclosed in Appendix A.

a. Letter file OO 471.9/168, APG 471.94/44 dated 9 February 1953 and entitled "Test of Launcher, Rocket, 3.5" M20A1E1, (Ord R & DD Project TS4-4019 DA Priority 1A).

2. Related APG Reports.

a. Twentieth Report on Project TS4-4019 entitled "Contactor Latch Mechanism for 3.5" Rocket Launcher, M20".

b. First Report on Project TU2-1015A entitled "Development Tests of Rocket, HEAT, 3.5 Inch, T205E1, and Rocket, Practice, 3.5 Inch, T206E1 and T206E1".

3. Related APG Firing Records Nos. R2849, R2941, R3029, R3036 and R3056.

II. DESCRIPTION OF MATERIAL

A. 3.5 INCH ROCKET LAUNCHER, M20A1B1. (PRODUCTION).

1. The 3.5 Inch Rocket Launcher, M20A1B1, is a two-piece cast aluminum smooth-bore weapon of the open tube type and is fired by means of a double-action magnetic type electric firing mechanism housed in the trigger grips. It fires fin stabilized 3.5 Inch Rockets utilizing a Latch Contactor Mechanism which positions the rockets in the launcher and provides electric contacts to the rocket from the firing mechanism. The launcher is exhibited in APG Photographs A92115, A92116, A92117, A92118, and A92119, Appendix C.

2. The physical characteristics of this launcher follow:

a. Weight of launcher (with sling and shoulder stock)	13.4 Pounds
b. Overall length	60.5 Inches
c. Overall height (with shoulder stock)	12.5 Inches
d. Overall width (sight extended)	10.0 Inches
e. Weight of front barrel assembly	4.1 Pounds
f. Length of front barrel assembly	30.2 Inches
g. Weight of rear barrel assembly	9.3 Pounds
h. Length of rear barrel assembly	31.4 Inches
i. Type of firing mechanism	Electric
j. Metal of tube section	Cast Aluminum
k. Weight of sling	0.25 Pounds

3. This launcher consists of a front barrel assembly and a rear barrel assembly.

a. The front barrel assembly consists of a tube with a front barrel hook and a barrel latch strike both cast with the tube.

b. The rear barrel assembly consists of a tube, a rear barrel eye, and a barrel latch (both cast integral with the tube), an electric firing mechanism with a trigger guard, a latch contactor mechanism, a barrel coupling lock lever, a shoulder stock, and a sling assembly, reference APG Photographs Nos. A92117, A92118, Appendix C.

c. Latch Contactor Mechanism.

- (1) The mechanism as shown is APG Photograph Nos. A92115, A92116, and A92119, Appendix C, consists of two stops, a hot contact finger, a holding detent, an arming lever, a knife type safety switch, a shorting strip and a blast vane.

(2) Functioning

- (a) The arming lever operates all the moving parts of the latch mechanism and also operates the knife switch which acts as a loader's safety.
- (1) When the arming lever is up, the launcher is "armed", the stops are retracted from the launcher tube and the blast vane is in the firing position.
 - (2) When the arming lever is forward, the mechanism is "safe", the stops are in position in the launcher tube and the blast vane is out of the launcher tube.
 - (3) The knife switch forms a part of the electrical firing circuit of the launcher so that when the switch is open the launcher is "safe" and when the switch is closed the launcher is "armed".

(3) Loading

- (a) M28A2, M29A2, T205E1 or T206E1 series rocket are pushed into the breech of the launcher without regard to the position of the arming lever. If the mechanism is in the "fire" position, the rocket head will dearm and return the mechanism to the "safe" position as the rocket is loaded in the launcher. As the rocket head enters the launcher tube, the spring loaded stops of the latch mechanism are cammed up out of the tube by the rocket head thereby allowing the rocket to enter the tube. When the rocket head passes the spring loaded stops, they are forced back down in place in the launcher tube to contact the leading edge of the shroud ring of the fin assembly and stop the rocket in the firing position. When the forward motion of the rocket is stopped by the stops, the holding detent engages the groove of the shroud ring of the fin assembly (ground contact) and the hot contact finger rests on the hot contact band of the rocket. The rocket is now in the firing position and the firing circuit is complete except that the knife switch is open.

(4) Firing

- (a) The launcher is armed by pulling the arming lever up into the "fire" position. This retracts the stops, closes the knife switch and completes the firing circuit. To fire, the trigger of the firing mechanism is squeezed, this sends an electric current to the rocket motor which ignites the rocket.

(b) When the rocket is fired, the rocket must move forward 5/8 inch before the blast strikes the blast vane and trips the mechanism into the safe position making the launcher ready to receive the next round. This delay was incorporated in the design of the launcher to prevent the mechanism from being tripped too early and lowering the stops before the rocket had moved. If this happened the stops when tripped would have held the rocket in the launcher resulting in a runaway launcher.

(5) Unloading.

To unload in case of a misfire the launcher is made "safe" by pulling the arming lever downward and forward. This opens the knife switch thereby breaking the electrical circuit to the rocket and making the launcher "safe". The rocket can then be removed by depressing the holding detent of the latch contactor mechanism and pulling the rocket from the rear of launcher tube.

B. The 3.5 Inch Rocket Launcher, M20, with Latch Mechanism, T1, is the standard M20 Launcher which has been slightly altered by replacing the standard Contactor Latch with the T1 Latch Contactor Mechanism. This T1 Latch Contactor Mechanism is the same design and functions the same as the mechanism described in Paragraph II, A, 3, e above.

III. DETAILS OF TEST

A. PROCEDURE

1. 3.5" Rocket Launcher, M20A1B1, (Production)

a. Preparation for test

- (1) All four of the cast aluminum launchers, when received, were inspected for damage incurred during shipment.
- (2) The electric firing circuit of each launcher was tested by means of a firing mechanism output tester (hot contact finger to cold contact finger) to determine the power output.

b. Cycling test

- (1) Ten 3.5 Inch Practice Rockets, M29A2, were inerted by removing the igniter and propellant from the rocket motors. These inerted rockets were cycled through 3.5 Inch Rocket Launcher, M20A1B1, No. 207932, until one thousand rounds had been cycled through the launcher.
- (2) Each rocket cycled through the launcher was observed to determine if the rocket was positioned satisfactorily by the stops of the latch mechanism. At different stages of the cycling the latch mechanism was examined for damage and excessive wear.

c. Functioning test.

- (1) Twenty 3.5 Inch Practice Rockets, M29A2, were fired through each of 3.5 Inch Rocket Launchers, M20A1B1, Nos. 207932 and 207935.
- (2) Five 3.5 Inch Practice Rockets, M29A2, were fired through each of 3.5 Inch Rocket Launchers, M20A1B1, Nos. 207931 and 207931.

d. Environmental tests.

(1) Hot test

- (a) Launcher, M20A1B1, Nos. 207932 and 207935 were temperature conditioned for six hours at plus 120°F.
- (b) Five 3.5 Inch Practice Rockets, M29A2, were fired through each launcher for launcher functioning.

(2) Cold test

- (a) Launchers, M20A1B1, Nos. 207932 and 207935, were temperature conditioned for six hours at minus twenty degrees Fahrenheit.
- (b) Five 3.5 Inch Practice Rockets, M29A2, were fired through each launcher for launcher functioning.

(3) Dust test

- (a) Launchers, M20A1B1, Nos. 207932 and 207935 were exposed to a continuous dust blast for a period of two minutes as described in paragraph 17 of OPM Z1-10, except that the muzzle and breech ends of the launchers were not closed.
- (b) Five 3.5 Inch Practice Rockets, M29A2, were fired through each launcher for functioning.

(4) Rain test

- (a) Launchers, M20A1B1, Nos. 207932 and 207935, were exposed to a water spray for a period of one hour with both the breech and muzzle ends of the tube open.
- (b) Five 3.5 Inch Practice Rockets, M29A2, were fired through each launcher for functioning.

(5) Mud test

- (a) Launchers, M20A1B1, Nos. 207932 and 207935, were immersed in a mud bath consisting of ten parts red clay and two parts clean river sand mixed with water for a period of twenty seconds. After immersion, the gunner used his bare hands

to remove excess mud from the latch mechanism and the bore of the launcher.

- (b) Five 3.5 Inch Practice Rockets, M29A2, were fired through each launcher for functioning.

e. Aimed Rapid Fire Test.

- (1) Launcher, M20A1E1, No. 207932, mounted on a lightweight Tripod-Mount, T113E2, with Cradle Assembly, T20, was used for this test.
- (2) Two men, who were acquainted with the launcher fired twenty-five 3.5 Inch Practice Rockets, M29A2, at a seven feet wide by four feet high vertical target at a range of one-hundred yards for an aimed rapid fire test of the launcher. One man loaded the rounds, and the second man aimed and fired the launcher.

f. A M20A1E1 Launcher (Production) was used as a proof facility to fire fifteen 3.5 Inch Practice Rockets T206E1, five at minus 40°F temperature, five at plus 70°F temperature, and five at plus 125°F temperature for a launcher recoil test, reference APG Firing Record No. R-3056 inclosed as part of the First Report on Ordnance Project No. TU2-1015A.

2. 3.5 Inch Rocket Launcher, M20, No. 153679, with Latch Contactor Mechanism, T1 (Development).

a. The launcher, when received, was inspected for damage incurred during shipment.

b. The electric firing circuit of the Launcher was tested by means of a firing mechanism output tester (hot contactor finger to cold contact finger) to determine the power output.

c. No specific firing tests were conducted on this Launcher. However, it was used as a proof facility for the development engineering testing of the 3.5 Inch HEAT Rocket, T205E1, and 3.5 Inch Practice Rocket, T206 and T206E1. During these tests the following rockets were fired from this launcher.

- (1) 184 each 3.5 Inch Practice, Rocket, T206.
- (2) 200 each 3.5 Inch Practice Rocket, M29A2.
- (3) 200 each 3.5 Inch Practice Rocket, T206E1.
- (4) 175 each 3.5 Inch HEAT Rocket, T205E1.

B. RESULTS

1. 3.5 Inch Rocket Launcher, M20A1B1, (Production).

a. During preparation for test.

- (1) No damage to the launchers was discovered when they were inspected upon arrival at this Proving Ground. All moving parts of the launchers functioned satisfactorily.
- (2) The electrical firing circuit of each launcher was complete and functioned satisfactorily. The electrical output of the launcher firing mechanism follows:

Launcher No.	Output	Launcher No.	Output
	milliwatt, sec.		milliwatt, sec.
207931	44	207935	40
207932	43	207931	45

- (3) The weights and other characteristics of the launchers are recorded in paragraph II, A, of this report.
- (4) The Latch Contactor Mechanism functioned satisfactorily both mechanically and electrically.

b. Cycling test

- (1) The Latch Contactor Mechanism correctly positioned all but three of the one-thousand inserted rockets cycled through the Launcher. These three rockets over-rode the stops of the Latch Contactor Mechanism and passed too far into the Launcher to be fired. The cause of these three malfunctions was not ascertained.
- (2) The Latch Contactor Mechanism was in good working order after this cycling test. No damage or excessive wear was observed in any of the parts of the mechanism.

c. Functioning test.

- (1) The Latch Contactor Mechanism of all four launchers correctly positioned and fired all of the rounds satisfactorily.
- (2) No misfires or launcher malfunctions were experienced during this test.

d. Environmental Tests.

- (1) A summary of the results of the environmental tests follows:

<u>Test</u>	<u>Launcher Serial No.</u>	<u>No. of Rounds Fired</u>	<u>Launcher Functioning</u>
Hot	207932	5	Satisfactory
	207935	5	Satisfactory
Cold	207932	5	Satisfactory
	207935	5	Satisfactory
Dust	207932	5	Satisfactory
	207935	5	Satisfactory
Rain	207932	5	Satisfactory
	207935	5	Satisfactory
Mud	207932	5	Satisfactory
	207935	5	Satisfactory

e. Aimed Rapid Fire Test.

- (1) The latch contactor mechanism of the launcher positioned and fired all of the rockets satisfactorily.
- (2) No misfires or launcher malfunctions were experienced during this test.
- (3) The total elapsed time for firing twenty-five rounds was one minute and fifty seconds. This is an average rate of fire of fourteen rounds per minute.
- (4) Twenty-two of the twenty-five rounds impacted the four foot by seven foot target at a range of 100 yards in a 45 inch by 68 inch area. The three rounds which were misses passed to the right of the target.

f. The Launcher and Latch Contactor Mechanism (Production) correctly positioned and fired all the T206K1 Rockets satisfactorily and was not damaged by any of the firings, reference First Report on Ordnance Project No. TU2-1015A.

2. 3.5 Inch Rocket Launcher, M20, No. 153679, with Latch Contactor Mechanism, TL (Development).

- a. The Launcher assembly, when received, was free from damage.
- b. The electrical firing circuit of the Launcher was complete and the electrical output of the firing mechanism was 48 milliwatt seconds.
- c. The Latch Contactor Mechanism correctly positioned all rockets loaded into the launcher during the firing tests.
- d. After one-hundred and eighty-four T206 Rockets, two-hundred M29A2 Rockets and fifty-five T206K1 Rockets had been fired through this Launcher, the shorting strip was blown off of the TL Latch Contactor Mechanism, reference APO Photographs A88892, Appendix C, and the edges of the latch cover were forced out of place.
- e. During the firing tests launcher misfires were experienced. These misfires were caused by the loss of the insulation between the launcher contact spring

clamp and the contact lead wire conduit of the T1 Latch Contactor Mechanism. This allowed the firing circuit to become shorted thus causing the launcher to misfire. The insulation was replaced and firing was resumed.

f. No other Latch Contactor Mechanism malfunctions were experienced.

g. Details of the firings are recorded in the First Report on Ordnance Project No. TU2-1015A.

C. OBSERVATIONS

1. It was observed that the insulation on the contact lead wire of the M20A1EL Launcher (Production) was partially worn away at the point where this wire is squeezed between the cover and the bearing holder of the Latch Contactor Mechanism. If this insulation is broken, the launcher firing circuit will be "shorted out" causing the launcher to misfire. Although this never occurred during any testing at this Proving Ground, it is believed that there is a good possibility of this occurring thereby causing launcher misfires. This condition would be especially aggravated during combat operation when the cover of the Latch Contactor Mechanism must be removed and replaced during cleaning and/or servicing of this Mechanism.

2. When a section of the leading edge of the shroud ring of the rocket fin assembly is depressed or dented one-sixteenth of one inch or more, the steps of the Latch Contactor Mechanism of the M20A1EL Launcher (Production) will ride over the damaged shroud section, thereby allowing the rocket to pass too far into the Launcher tube to be fired.

3. The production model Latch Contactor Mechanism stops were thinner in web section and offered a more curved leading edge to position the rockets than did the stops of development model Latch Contactor Mechanism.

IV. CONCLUSIONS

It is concluded that:

A. The M20A1EL Launchers functioned satisfactorily on functioning and environmental tests except for the wearing of the insulation of the hot lead wire near the point where it attaches onto the knife switch post of the Latch Contactor Mechanism, reference paragraph III, C, 1.

B. The rate of fire of the M20A1EL Launcher is higher than that of the M20 or M20EL Launcher, reference paragraph III, B, 1, e. (3).

C. The shorting strip of the T1 Latch Contactor Mechanism on the 3.5" Rocket Launcher, M20 was not strong enough to withstand the shock of firing the 3.5 Inch HEAT Rocket, T205EL, (Practice Rocket T206EL), reference paragraph III, B, 2. d.

V. RECOMMENDATIONS

It is recommended that

A. The contact lead wire of the Latch Contactor Mechanism be run through a grommet in the bearing holder at the point where it now passes over said bearing holder of the Latch Contactor Mechanism.

B. The shorting strip of the Latch Contactor Mechanism be strengthened so as to be satisfactory for firing 3.5 Inch HEAT Rockets, T205E1 (Practice Rocket T206E1).

C. The M20A1B1 Launcher be considered acceptable for Army Field Forces Evaluation Tests.

B. McClothlin
B. McCLOTHLIN
Pfc., Ord Corps
Project Engineer

APPROVED:

T.F. Collier
for T.F. COLLIERAN
Director, Development and
Proof Services.

P.S. Goodwin
P.S. GOODWIN
Acting Chief
Arms & Amn. Div.

APPENDICES

- APPENDIX A - Correspondence
- APPENDIX B - APG Firing Record
- APPENDIX C - APG Photographs

APPENDIX A

Correspondence

NY082

ECAO,3 I

RR USTCH

RI 021

RR UEC ZVA

RR UEPAD USTCH 222

IE WUCHI 021

R 091513Z

FM CG ROCK ISLAND ARSENAL ILL

TO UEPAD/COFORD WASHDC

INFO USTCH/CG ABERDEEN FVG GD MD

DA OHSC

FROM OHSC WILHELM TT 17743 FOR ORDIS R PALISE AND ORING SMITH C FIELD

FOUR LAUNCHERS ROCKET 3.5" M20A1B1 WITH LATEST IMPROVED CONTACTOR LATCH

SHIPPED APO 5 JUNE 53 BY AIR FREIGHT ON BEARING WY 2244847

REF 17743 3.5" M20A1B1 5 53 2244847

6

09/1513Z

BC 1623Z

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WAR DEPARTMENT
OFFICE OF THE CHIEF OF ORDNANCE
WASHINGTON, D.C.

RFlanagan/rmm/52368

OO 471.9/168
APG 471.94/44

9 February 1953

SUBJECT: Test of Launcher, Rocket, 3.5" M20A1B1
(Ord R&DD Project TS4-4019; DA Priority 1A)

TO: Commanding General
Aberdeen Proving Ground, Maryland

1. Shortly there will be shipped to your station four each Launchers, Rocket, 3.5", M20A1B1 which have been taken from current production the Birtman Electric Company.

2. It is requested that these launchers be tested to determine their suitability for field use, functional reliability and performance, and that results of tests be furnished this office by letter prior to preparation of the formal report.

BY COMMAND OF MAJOR GENERAL FORD:

/s/ Edward B. Grossman
EDWARD B. GROSSMAN
Lt Col, Ord Corps
Assistant

APPENDIX B

Firing Record
No. R-3068

DEVELOPMENT AND PROOF SERVICES
ABERDEEN PROVING GROUND, MARYLAND
FIRING RECORD

OBJECT OF TEST: Production Engineering Firing
Tests of 3.5 Inch Rocket
Launcher, M20A1B1.

DATES OF TEST: 17-19 June 1953
FIRING RECORD NO. R-3068
SHEET 1 OF 6
AUTHORITY: OO 471.9/168
APG 471.94/44
W.O. NO. 964-16-00-3

DEVELOPMENT: ORDTs
Project No. TS4-4019
Related Firing Record Nos. R-3036, R-3056

1r

MATERIEL

3.5 Inch Rocket Launcher, M20A1B1, Nos. 207931, 207932, 207935
and 207981 (See Round-by-Round Data).

AMMUNITION

117 Each 3.5 Inch Practice Rocket, M29A2, Lot NO. NOP-1-12.

FACILITIES

Heavy Machine Gun Mount, M1917A2, with modified cradle to
receive the 3.5 Inch Rocket Launchers.
Cradle Assembly, T20.
Tripod Mount Assembly, T113E2.

FIRING RECORD NO. R-3068
SHEET 2 OF 6

ROUND-BY-ROUND DATA
I FUNCTIONING TEST PHASE

19 June 1953

<u>SAMPLE TEST NO.</u>	<u>TIME OF FIRING</u>	<u>ELEV. (mils)</u>	<u>LAUNCHER SERIAL NO.</u>	<u>LAUNCHER FUNCTIONING</u>	<u>ROCKET TEMPERATURE (°F)</u>
1	1045	130	207932	S	470
2	1045	130	207935	S	470
3	1047	130	207932	S	470
4	1047	130	207935	S	470
5	1049	130	207932	S	470
6	1049	130	207935	S	470
7	1051	130	207932	S	470
8	1051	130	207935	S	470
9	1053	130	207932	S	470
10	1053	130	207935	S	470
11	1055	130	207932	S	470
12	1055	130	207935	S	470
13	1057	130	207932	S	470
14	1057	130	207935	S	470
15	1100	130	207932	S	470
16	1100	130	207935	S	470
17	1102	130	207932	S	470
18	1102	130	207935	S	470
19	1105	130	207932	S	470
20	1105	130	207935	S	470
21	1106	130	207932	S	470
22	1106	130	207935	S	470
23	1108	130	207932	S	470
24	1108	130	207935	S	470
25	1109	130	207932	S	470
26	1109	130	207935	S	470
27	1111	130	207932	S	470
28	1111	130	207935	S	470
29	1112	130	207932	S	470
30	1114	130	207935	S	470
31	1115	130	207932	S	470
32	1115	130	207935	S	470
33	1117	130	207932	S	470
34	1117	130	207935	S	470
35	1118	130	207932	S	470
36	1118	130	207935	S	470
37	1119	130	207932	S	470
38	1119	130	207935	S	470
39	1121	130	207932	S	470
40	1121	130	270935	S	470
41	1127	130	207931	S	470
42	1127	130	207981	S	470

FIRING RECORD NO. R-3068
SHEET 3 OF. 6

SAMPLE TEST NO.	TIME OF FIRING	ELEV (mils)	LAUNCHER SERIAL NO.	LAUNCHER FUNCTIONING	ROCKET TEMPERATURE (°F)
43	1129	130	207931	S	170
44	1130	130	207981	S	170
45	1132	130	207931	S	170
46	1132	130	207981	S	170
47	1133	130	207931	S	170
48	1133	130	207981	S	170
49	1135	130	207931	S	170
50	1135	130	207981	S	170

S = Denotes satisfactory

Rockets C/R - Data not taken.

II-ENVIRONMENTAL TEST PHASES

17-19 June 1953

A. TEMPERATURE TESTS

SAMPLE TEST NO.	TIME OF FIRING	ELEV (mils)	LAUNCHER SERIAL NO.	TIME LAUNCHER & ROCKET REMOVED FROM TEMPERATURE BOX	LAUNCHER & ROCKET TEMPERATURE (°F)	LAUNCHER FUNCTION- ING
17 June 1953						
51	1007	130	207932	1004	-20	S
52	1008	130	207932	1004	-20	S
53	1009	130	207932	1004	-20	S
54	1016	130	207935	1014	-20	S
55	1017	130	207935	1014	-20	S
56	1018	130	207935	1014	-20	S
19 June 1953						
57	1521	131	207935	1519	120	S
58	1522	131	207935	1519	120	S
59	1523	131	207935	1519	120	S
60	1526	131	207932	1524	120	S
61	1527	131	207932	1524	120	S
62	1528	131	207932	1524	120	S

III-RAPID FIRE & ADJUSTMENT TEST

19 June 1953

Target 4 feet high by 7 feet wide.

SAMPLE TEST NO.	TIME OF FIRING	LAUNCHER SERIAL NO.	LAUNCHER FUNCTIONING	ROCKET TEMPERATURE (°F)	TARGET RANGE (yds)	TARGET IMPACT	REMARKS
93	1516	207932	S	70	100	Hit	
94	1516	207932	S	70	100	Hit	
95	1516	207932	S	70	100	Hit	
96	1516	207932	S	70	100	Miss	Right of target
97	1516	207932	S	70	100	Miss	Right of target
98	1516	207932	S	70	100	Miss	Right of target
99	1516	207932	S	70	100	Hit	
100	1516	207932	S	70	100	Hit	
101	1516	207932	S	70	100	Hit	
102	1516	207932	S	70	100	Hit	
103	1516	207932	S	70	100	Hit	
104	1516	207932	S	70	100	Hit	
105	1516	207932	S	70	100	Hit	
106	1516	207932	S	70	100	Hit	
107	1516	207932	S	70	100	Hit	
108	1517	207932	S	70	100	Hit	
109	1517	207932	S	70	100	Hit	
110	1517	207932	S	70	100	Hit	
111	1517	207932	S	70	100	Hit	
112	1517	207932	S	70	100	Hit	
113	1517	207932	S	70	100	Hit	
114	1517	207932	S	70	100	Hit	
115	1517	207932	S	70	100	Hit	
116	1517	207932	S	70	100	Hit	
117	1517	207932	S	70	100	Hit	

S - Denotes satisfactory

Rocket C/R - Data not taken

Elevation - Data could not be determined.

Total firing time - 110 seconds.

The 22 rounds impacted in an area 45" high by 68" wide.

FIRING RECORD NO. R-3068
SHEET 4 OF 6

B. DUST TEST

19 June 1953

SAMPLE TEST NO.	TIME OF FIRING	ELEV (mils)	LAUNCHER SERIAL NO.	LAUNCHER FUNCTIONING	ROCKET TEMPERATURE (°F)
63	1330	131	207932	S	+70
64	1330	131	207935	S	+70
65	1331	131	207932	S	+70
66	1332	131	207935	S	+70
67	1333	131	207932	S	+70
68	1333	131	207935	S	+70
69	1335	131	207932	S	+70
70	1335	131	207935	S	+70
71	1337	131	207932	S	+70
72	1337	131	207935	S	+70

C. RAIN TEST

73	1430	130	207935	S	+70
74	1430	130	207932	S	+70
75	1431	130	207935	S	+70
76	1431	130	207932	S	+70
77	1433	130	207935	S	+70
78	1433	130	207932	S	+70
79	1434	130	207935	S	+70
80	1434	130	207932	S	+70
81	1436	130	207935	S	+70
82	1436	130	207932	S	+70

D. MUD TEST

83	1501	130	207932	S	+70
84	1501	130	207935	S	+70
85	1503	130	207932	S	+70
86	1503	130	207935	S	+70
87	1504	130	207932	S	+70
88	1504	130	207935	S	+70
89	1506	130	207932	S	+70
90	1506	130	207935	S	+70
91	1507	130	207932	S	+70
92	1507	130	207935	S	+70

S = Satisfactory

Rocket C/R - Data not taken.

FIRING RECORD NO. R-3068
SHEET 6 OF 6

REMARKS

1. Before any firing was done inerted 3.5 Inch Practice Rockets, M29A2, were cycled through launcher numbered 207932 one thousand times. The latch mechanism positioned the rockets satisfactorily in all cases except cycles numbers 863, 944 and 946.
2. Except for the rockets fired during the rapid fire test which were fired manually, all the rockets were fired remotely. A lanyard arrangement was used to pull the launchers firing mechanisms.
3. All the rockets were loaded into the launcher tubes without difficulty.
4. In every case except the cycling test mentioned above the latch mechanism positioned all of the rockets satisfactorily.
5. No misfires were experienced during any of the firings.
6. Mr. Ralph Flanagan and Mr. R.P. Palese from OCO and Mr. T. Kyle from the Birtman Electric Company witnessed tests conducted on 19 June 1953.
7. This firing record forms a part of the Twenty-First Report on Project TS4-4019.

APPROVED:

B.S. Goodwin
B.S. GOODWIN
Acting Chief,
Arms & Amm Div.

M. D. Kaplan
MORRIS D. KAPLAN
Chief, Artillery &
Rocket Branch

Bruce Mc Glothlin
BRUCE MCGLOTHLIN
Pfc. Ord Corps
Project Engineer

25

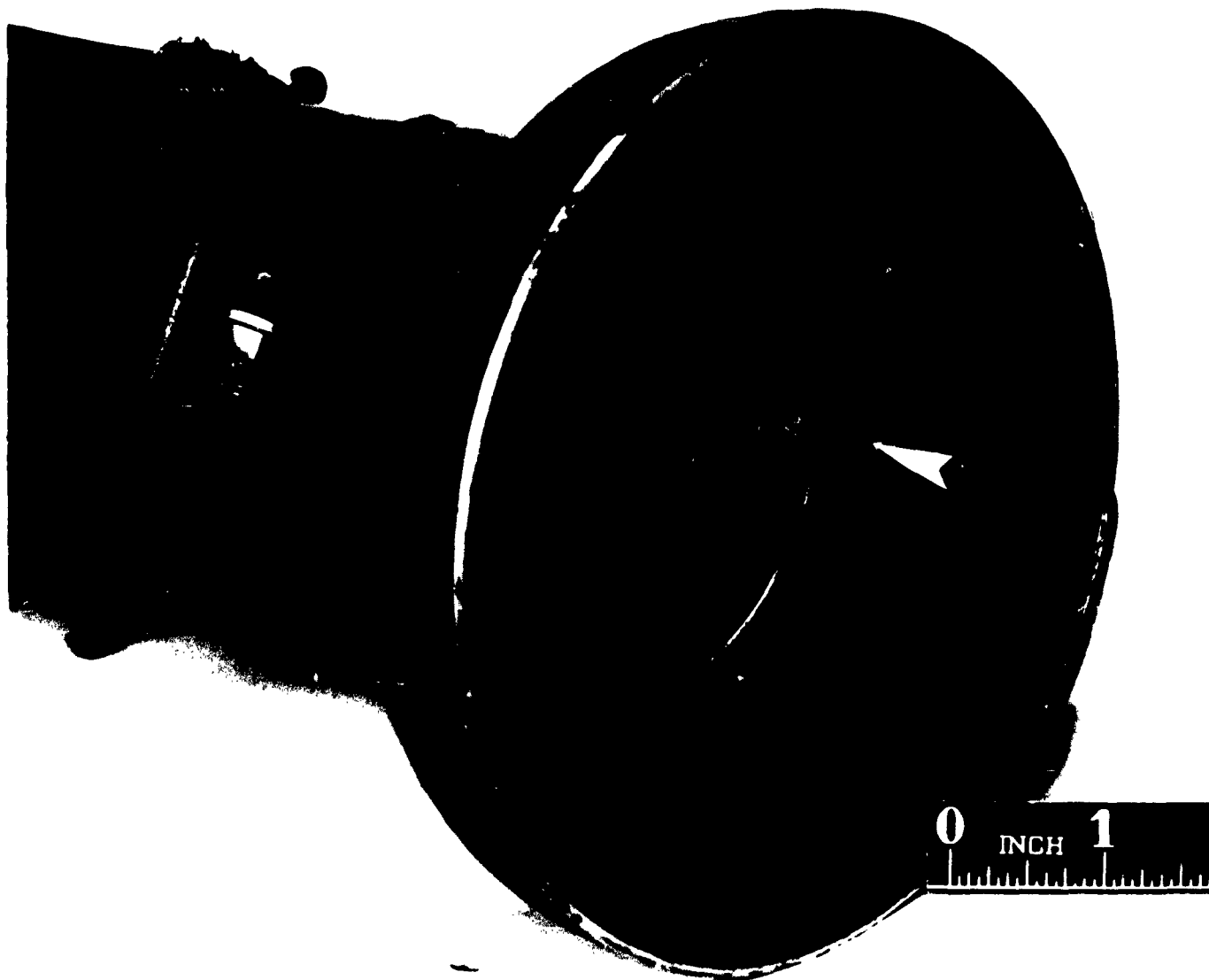
APPENDIX C

APG PHOTOGRAPHS

A88892	A92117
A92115	A92118
A92116	A92119

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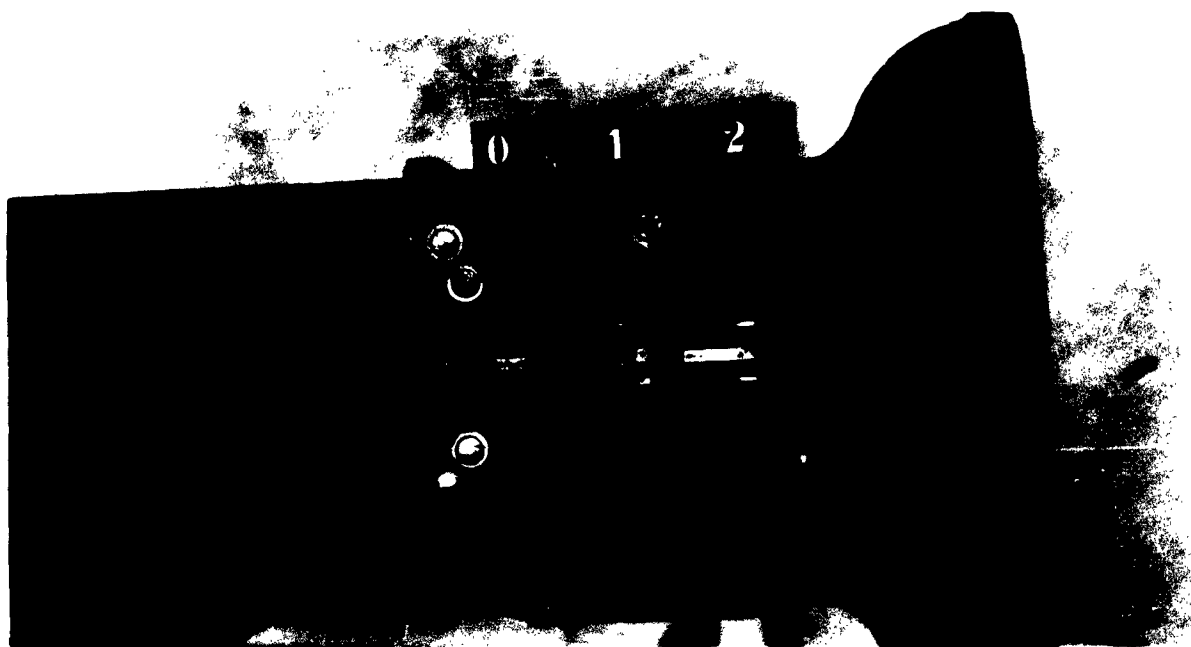
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A88892 ~~CONFIDENTIAL~~ 8 ABERDEEN PROVING GROUND 8 17 August 1953

Project No. TS4-4019. Rocket Launcher, 3.5", M20A1B1, No. 153679, W/T1 Latch.

Shorting strip blew off T1 latch mechanism after the following rockets were fired through the launcher: 184, T-206; 200, M29A2; and 55, T-206E1.



490115 **8 ABERDEEN PROVING GROUND 8** 27 August 1966
 Project No. TS4-4019. Rocket Launcher, 3.5", M20A1B1.
 Latch mechanism with cover removed. TOP: Latch mechanism in fire
 position. BOTTOM: Latch mechanism in safe position.



A92116 **8 ABERDEEN PROVING GROUND 8**

27 August 1953

Project No. TS4-4019. Rocket Launcher, 3.5", M20A1B1.

Breech end. TOP: Rear view of launcher with cocking lever of latch mechanism in safe position. BOTTOM: Left side view of launcher with cocking lever of latch mechanism in safe position.



A92117

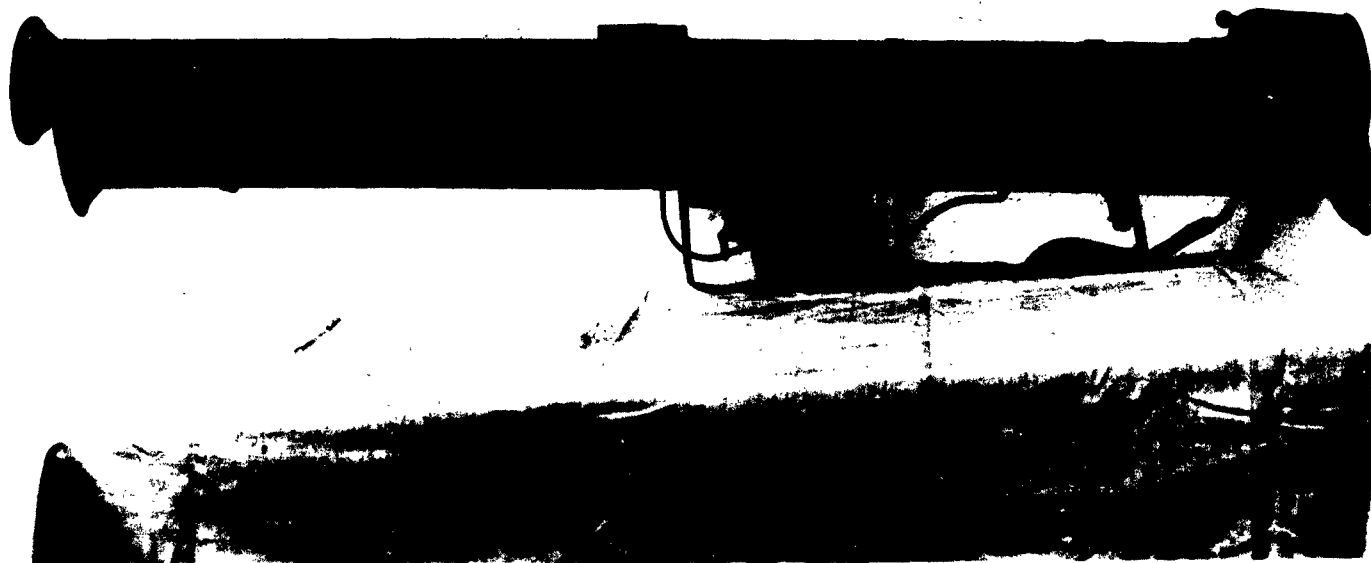
ABERDEEN PROVING GROUND

27 August 1953

Project No. TS4-4019. Rocket Launcher, 3.5", M20A1B1.

Reflecting sight assembly (ladder type reticle pattern) in folded position and firing mechanism (double action).

~~CONFIDENTIAL~~ ~~SECRET~~ - ~~CONFIDENTIAL~~

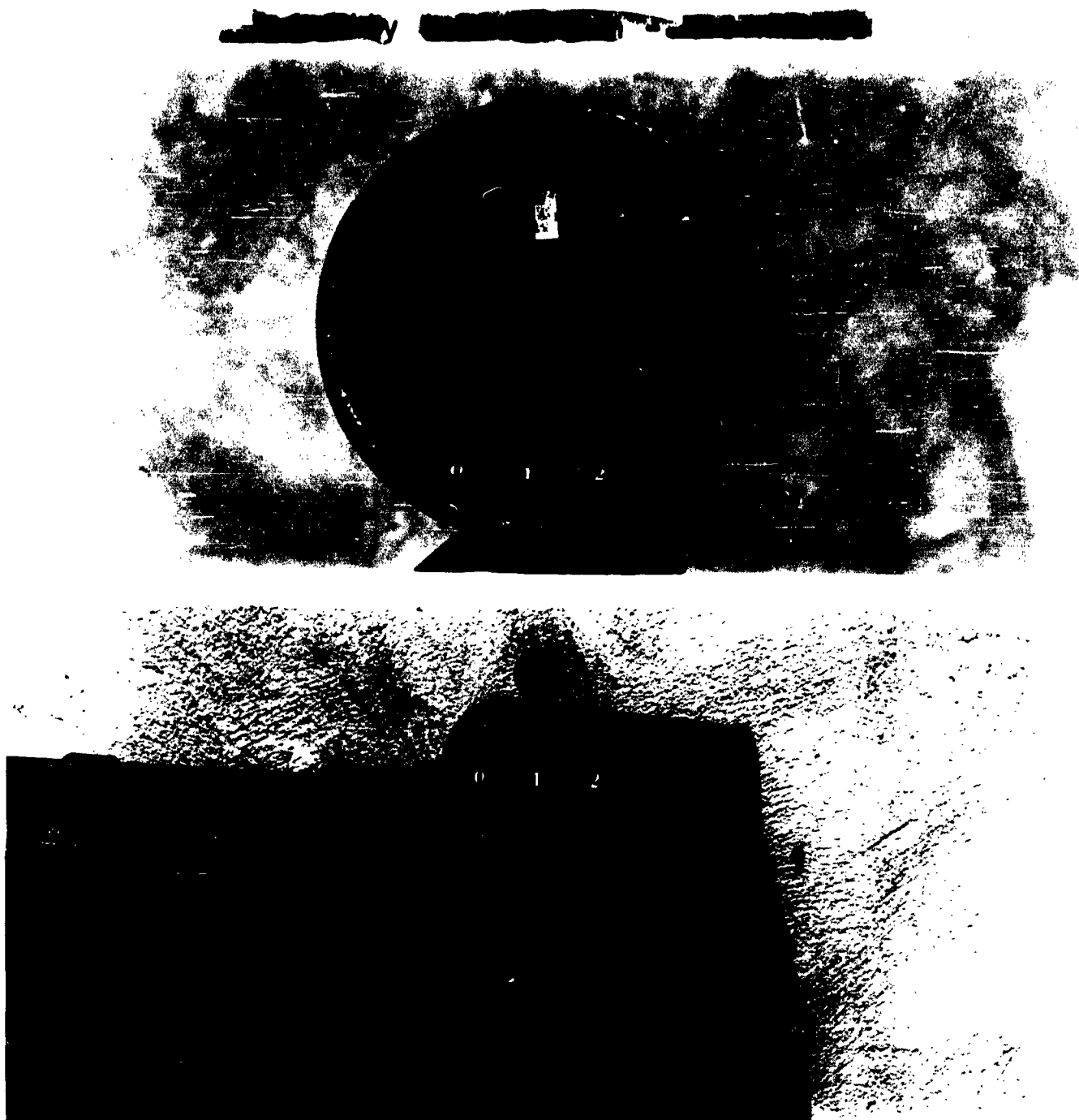


A92112 ~~CONFIDENTIAL~~

8 ABERDEEN PROVING GROUND 8

27 AUGUST 1953

Project No. TS4-4019. Rocket launcher, 3.5", U20A1B1.
Equipped with shoulder stock.



A92119

ABERDEEN PROVING GROUND

27 August 1953

Project No. TS4-4019. Launcher, Rocket, 3.5", M20A1B1.

TOP: Breech end of launcher with cocking lever of latch mechanism in fire position. BOTTOM: Left side of launcher with cocking lever of latch mechanism in fire position.